

CLAIMS:

1. A system for imaging an object, comprising:
an objective lens configured to direct light to the object; and
a coupling lens configured to receive light reflected from a surface of the object and transmitted through the objective lens, and to focus the reflected light as an image of the object; and
an annular light emitter arranged concentrically with an optical axis of the objective lens and the coupling lens, and configured to emit to the objective lens the light directed to the object.
2. The system of Claim 1, wherein the annular light emitter comprises:
a white light emitter.
3. The system of Claim 2, wherein the white light emitter comprises:
a white light emitting diode.
4. The system of Claim 3, wherein the white light emitting diode comprises:
a plurality of white light emitting diodes; and
a ring support configured to position said plurality of said white light emitting diodes off axis from a central axis extending from the coupling lens to the objective lens.
5. The system of Claim 2, wherein the white light emitter comprises:
a red light emitting diode;
a green light emitting diode; and

a blue light emitting diode.

6. The system of Claim 5, further comprising:

an infrared light emitting diode configured to irradiate the object with infrared light for alignment of the object prior to image capture.

7. The system of Claim 6, further comprising:

an image recorder configured to capture the image of the object in an infrared range.

8. The system of Claim 1, wherein the annular light emitter comprises:

a plurality of light emitting diodes including at least one of a red light emitting diode, a green light emitting diode, and a blue light emitting diode.

9. The system of Claim 8, further comprising:

an infrared light emitting diode configured to irradiate the object with infrared light for alignment of the object prior to image capture.

10. The system of Claim 9, further comprising:

an image recorder configured to capture the image of the object in an infrared range.

11. The system of Claim 10, wherein the image recorder is configured to

capture the image of the object in a visible range.

12. The system of Claim 1, wherein the coupling lens is configured to be focused at infinity and is configured to magnify the image of the object.

13. The system of Claim 12, wherein the coupling lens comprises:
a refractive lens having a range of refractive power from 5 to 60 diopter.

14. The system of Claim 13, wherein the coupling lens has a refractive power of at least 10 diopter.

15. The system of Claim 1, wherein the objective lens comprises:
a refractive lens having a range of refractive power from 20 to 90 diopter.

16. The system of Claim 15, wherein the objective lens has a refractive power of at least 60 diopter.

17. The system of Claim 1, further comprising:
a support for the annular light emitter, the objective lens, and the coupling lens.

18. The system of Claim 17, further comprising:
an image recorder connected to the support and configured to capture the image.

19. The system of Claim 18, wherein the image recorder comprises a digital camera.

20. The system of Claim 1, further comprising:
an image recorder configured to capture the image.

21. The system of Claim 20, wherein the image recorder comprises a camera.

22. The system of Claim 21, further comprising:
a computer;
said camera configured to record image streams; and
said computer configured to produce still images from the image streams.

23. The system of Claim 1, further comprising:
an image recorder configured to capture the image and record image streams;
and
a computer configured to produce still images from the image streams.

24. The system of Claim 1, further comprising:
a baffle inserted in an optical path between the annular light emitter and the
objective lens,
said baffle configured to block light from the annular light emitter from being
incident on a central region of the objective lens.

25. The system of Claim 24, wherein the annular light emitter and the baffle are
positioned between the coupling lens and the objective lens.

26. The system of Claim 25, wherein the baffle is disposed concentric to the optical axis and interior to the annular light emitter, and extends radially to block a part of the light from the annular light emitter that would be incident on a central region of the objective lens.

27. The system of Claim 26, wherein the baffle comprises:
a conical frustum.

28. The system of Claim 26, wherein the baffle is configured to block at least 10% of the objective lens from receiving said light.

29. The system of Claim 26, wherein the baffle is configured to block at least 50% of the objective lens from receiving said light.

30. The system of Claim 26, wherein the baffle is configured to block at least 90% of the objective lens from receiving said light.

31. The system of Claim 24, wherein the annular light emitter and the baffle are positioned between the image recorder and the coupling lens.

32. The system of Claim 31, wherein the baffle is disposed concentric and interior to the annular light emitter, and extends radially to block a part of the light from the annular light emitter that would be incident on a central region of the objective lens and the coupling lens.

33. The system of Claim 32, wherein the baffle comprises:
a conical frustum.

34. The system of Claim 32, wherein the baffle is configured to block at least 10% of the objective lens from receiving said light.

35. The system of Claim 32, wherein the baffle is configured to block at least 10% of the coupling lens from receiving said light.

36. The system of Claim 32, wherein the baffle is configured to block at least 50% of the objective lens from receiving said light.

37. The system of Claim 32, wherein the baffle is configured to block at least 50% of the coupling lens from receiving said light.

38. The system of Claim 32, wherein the baffle is configured to block at least 90% of the objective lens from receiving said light.

39. The system of Claim 32, wherein the baffle is configured to block at least 90% of the coupling lens from receiving said light.

40. The system of Claim 1, further comprising:
a linear polarizing filter and a quarter-wave circular polarizing plate disposed between the coupling lens and the objective lens.

41. The system of Claim 32, wherein the linear polarizing filter and the quarter-wave circular polarizing plate are configured by respective polarizations of the linear polarizing filter and the quarter-wave circular polarizing plate to exclude from said image multiply reflected light.

42. The system of Claim 1, wherein the coupling lens and the objective lens are separated by a distance from 80-150 nm.

43. The system of Claim 1, further comprising:
a synchronizer configured to power the annular light emitter upon a timed event.

44. The system of Claim 43, further comprising:
a camera configured to record the image of the object; and
said synchronizer is configured to power the annular light emitter upon a flash of a camera.

45. The system of Claim 1, wherein the objective lens is configured to image an interior of the object.

46. The system of Claim 45, wherein the objective lens is configured to image an ocular fundus.

47. The system of Claim 1, further comprising:
a fiber optic connected between the objective lens and the object.

48. The system of Claim 47, wherein the objective lens is configured to image an interior of the object.

49. The system of Claim 48, wherein the objective lens is configured to image at least one of an organ, an internal organ, a joint, and an internal body part.

50. A system for imaging an object, comprising:
a light source configured to emit light for illumination of the object;
an objective lens configured to direct said light to the object;
a coupling lens configured to receive light reflected from a surface of the object and transmitted through the objective lens, and to focus the received light as an image of the object;
a baffle inserted in an optical path from the light source and the objective lens;
and
said baffle configured to block light from the light source from being incident on a central region of the objective lens.

51. A system for imaging an object, comprising:
a light source configured to emit light for illumination of the object;
an objective lens configured to direct said light to the object;
a coupling lens configured to receive light reflected from a surface of the object and transmitted through the objective lens, and to focus the received light as an image of the object; and

said light source including an infrared light source configured to irradiate the object with infrared light for alignment of the object prior to image capture.

52. A system for imaging an object, comprising:

a light source configured to emit light for illumination of the object;

an objective lens configured to direct said light to the object;

a coupling lens configured to receive light reflected from a surface of the object and transmitted through the objective lens, and to focus the received light as an image of the object; and

said light source including a white light emitting diode and a green light emitting diode.

53. A method for imaging an object, comprising:

emitting light from an annular light emitter arranged concentrically with an optical axis for illuminating the object;

directing said light to the object;

receiving and focusing reflected light from a surface of the object; and

forming an image of the object.

54. The method of Claim 53, wherein the step of emitting comprises:

emitting white light.

55. The method of Claim 54, wherein the step of emitting white light comprises:

emitting white light from a white light emitting diode.

56. The method of Claim 55, wherein the step of emitting white light from a white light emitting diode comprises:

emitting white light from a plurality of white light emitting diodes disposed on an annulus.

57. The method of Claim 54, wherein the step of emitting white light comprises:

emitting red, green, and blue light.

58. The method of Claim 57, wherein the step of emitting red, green, and blue light comprises:

emitting light from a red light emitting diode,
emitting light from a green light emitting diode, and
emitting light from a blue light emitting diode.

59. The method of Claim 53, further comprising:

capturing the image of the object in a visible range.

60. The method of Claim 53, wherein the step of emitting comprises:

emitting an infrared light to irradiate the object for alignment of the object prior to image capture.

61. The method of Claim 60, further comprising:

capturing the image of the object in an infrared range.

62. The method of Claim 53, wherein the step of receiving and focusing light reflected from an interior surface of the object comprises:

focusing the reflected light at infinity; and
magnifying the image of the object.

63. The method of Claim 53, wherein the step of forming an image of the object comprises:

forming an image in a camera.

64. The method of Claim 53, wherein the step of forming an image of the object comprises:

forming image streams of the object.

65. The method of Claim 53, wherein the step of forming image streams further comprises:

selected still images from the image streams.

66. The method of Claim 53, wherein the step of directing said light into the interior of the object comprises:

blocking light from the annular light emitter from being incident on a central region of an objective lens focusing the light from the annular light emitter into the interior of the object.

67. The method of Claim 66, wherein the step of blocking light comprises:

excluding at least 10% of the objective lens from receiving the light.

68. The method of Claim 66, wherein the step of blocking light comprises:

excluding at least 50% of the objective lens from receiving the light.

69. The method of Claim 66, wherein the step of blocking light comprises:

excluding at least 90% of the objective lens from receiving the light.

70. The method of Claim 53, wherein the step of directing said light into the interior of the object comprises:

blocking light from the annular light emitter from being incident on a central region of a coupling lens receiving said reflected light from the interior of the object.

71. The method of Claim 70, wherein the step of blocking light comprises:

excluding at least 10% of the coupling lens from receiving the light.

72. The method of Claim 70, wherein the step of blocking light comprises:

excluding at least 50% of the coupling lens from receiving the light.

73. The method of Claim 70, wherein the step of blocking light comprises:

excluding at least 90% of the coupling lens from receiving the light.

74. The method of Claim 53, the step of forming an image of the object comprises:

utilizing polarizing plates to exclude from said image multiply reflected light.

75. The method of Claim 53, further comprising:

synchronizing power to the annular light emitter upon a timed event.

76. The method of Claim 75, further comprising:

recording the image of the object upon a flash of a camera.

77. A computer readable medium containing program instructions for execution on a computer system, which when executed by the computer system, cause the computer system to image an object by performing the steps of:

controlling light emission from an annular light emitter arranged concentrically with an optical axis for illuminating the object; and

capturing the image of the object from light directed to the object from the annular light emitter, reflected from a surface of the object, and imaged onto an image recorder.

78. The computer readable medium of Claim 77, further comprising instructions for performing the step of:

synchronizing power to the annular light emitter upon a timed event.

79. The computer readable medium of Claim 78, further comprising instructions for performing the step of:

recording the image of the object upon a flash of a camera.

80. The computer readable medium of Claim 77, further comprising instructions for performing the step of:

forming image streams of the object.

81. The computer readable medium of Claim 80, further comprising instructions for performing the step of:

selecting still images from the image streams.